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QR – Issue QR – Article

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THE POSSIBILITIES AND PROSPECTS OF QR CODE TECHNOLOGIES IN THE MODERN EDUCATIONAL ENVIRONMENT

Abstract*: The article discusses the need for the widespread introduction of digital technologies and modern methods in the educational process, the creation of a system of posting information about electronic resources in the higher education system using QR codes, opportunities to use QR codes to present diplomas and applications to graduates of leading universities, the specifics of their use, as well as their role in ensuring the interactive exchange of information between graduates and employers.*

Key words*: QR code, fast response, flexibility, modularity, information security, unification, heterogeneous network environment.*

Language*: English*

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Introduction

Modern technologies are evolving at a rapid pace. Digital systems are being introduced in many areas of activity: hospitals, catering establishments and educational institutions. The increase in the amount of data collected and analyzed in the process of higher education management and the decision-making process through them causes many difficulties, and the digitalization of the education system is one of the most pressing issues in solving this problem.

On October 8, 2019, the President of the Republic of Uzbekistan signed a decree "On approval of the Concept of development of the higher education system of the Republic of Uzbekistan until 2030."

This concept is aimed at improving the quality of education, training competitive personnel, effective organization of scientific and innovative activities, development of international cooperation, based on the needs of the social sphere and the economy, the integration of science, education and industry. Developed in pursuance of the Resolution № PQ-4391 of July 11, 2019 "On measures to introduce new management principles in the system of higher and secondary special education", strategic goals, priorities, objectives, secondary and long-term development of higher education in the Republic of Uzbekistan defines the stages of the long-term perspective and serves as a basis for the development of programs and comprehensive measures in the field [1].

In the modern information society, the level of development of information and communication technologies is growing rapidly every day. In recent years, their intensive use and global distribution, as well as the public's unlimited access to the Internet, have led to a multiplication of the amount of information. In this regard, there is a need to provide the user with information in a compact, easy-to-use, visual form. This allows the user to quickly and easily find the information they need among a large amount of data with minimal time and effort.

QR code is derived from the English word "Quick Response", which means "quick response". This system was created in 1994 by the Japanese Company which is named “Denso-Wave” [2].

QR code is a specially encoded piece of information, a square image. QR code can encode

information consisting of characters (Latin, Cyrillic, numbers and special). Such information may include site address, e-business card, telephone, e-mail address, coordinates of an object, and so on. A single QR code can contain 7089 numbers or 4296 letters.

Nowadays, modern phones with a camera make it easy to read QR coded data hidden under a square image. To do this, we can have the information encoded in it by pointing the phone camera at the QR code.

Main part.

The QR code allows you to encode any information, for example: text, phone number, links to a website or business card. A QR code frame is usually a black-and-white image that can be used to read mobile devices and computers with a built-in camera.

QR codes do not depend on a specific data format, i.e. the standard set for recording information in a file. Modern QR code scanning software can recognize text, graphics, web page information, email, SMS, phone numbers, geographic coordinates and other information [7]. By generating a QR code, the program displays the data type. To access the data on the cell phone display, you need to run the app to scan the code and direct the camera lens to the code. The decoder program recognizes the type of data and performs the necessary actions, for example, opens a web page (in this case, an Internet connection is also required).

The size of the QR code can be any, but the length of each side should be at least 2.5 cm for ease of reading and recognition. Smaller codes require higher-resolution devices than modern smartphones and tablets.

Note that QR codes are not licensed, so anyone can not only use them, but also create them for free. There are many services and programs for creating and promoting QR codes (for example, http://qrcoder.ru/). Specific features of using a QR code:

- *flexibility* – to be opened, flexible and adaptable to changes in external

conditions (e.g. changes in the regulatory framework or general legislation), which reduces the cost of maintaining and maintaining it;

- *reliability* – the system should back up the data without losing the logical integrity of the databases, restart the system after failures and emergencies, procedures to maintain the integrity of the data processing after system failure or other unscheduled, provide logical verification of access data. The hardware and organizational support of the system should ensure the use of guaranteed power sources, backup of storage facilities and main equipment nodes, backup of communication channels.

- *modularity* – it should consist of separate interacting modules built on an interface based on the installation of standard software packages that perform system functions. The structure of system modules can be supplemented in accordance with the unified principles of the organization.

- *information security* – the system must meet the requirements of information security of state information resources (systems).

- *unification* – the methods of describing, presenting, transmitting and processing data in electronic form must be combined.

- *heterogeneous network environment support* – the system must operate in a network environment built using different network and client operating systems that support TCP / IP and http / https protocols. The system must operate in a single information network of government agencies in accordance with applicable law.

Globalization processes affect all spheres of human life. Trends in social structure, the labor market, and the technologicalization of many areas of human life have posed serious challenges for the education system [6]. The ongoing processes of internationalization, globalization and commercialization in the educational process have an impact on the traditional activities of higher education institutions and require their functional transformation.

According to Researcher Kovalchuk V. I, the fourth industrial revolution will be accompanied by the emergence of new areas of human activity, as well as the problems of the education system. One of these problems is to reduce the range of activities that can increase human machine production efficiency. Experts estimate that by 2030, fifty types of occupations will disappear, and 186 new occupations will appear in their place.

At every stage of the development of society, information, information transformation has played an important role. However, over time, data collection has brought to the forefront the problem of rapid access to it, processing, analysis, systematization, and storage. This problem is partially solved by QR coding technology. In the world of digital technologies, there are many opportunities to use them in the educational process. In our opinion, the widespread introduction of digital technologies in the process of information exchange in higher education institutions will allow to improve the quality of education, diversify creative educational services.

There is still very little scientific research in the field of QR coding, but to understand the features of the technology, it plays an important role in the studies of V. Logachev [4] and A. Srybina [3].

On the threshold of the "information age", the QR code has become a useful tool that can be used in any area of life [5].

Results and discussions.

Issuance of state documents to graduates of higher education institutions of the Republic of Uzbekistan on the basis of state educational standards, regulation of activities related to the organization and conduct of ceremonial congratulations of students admitted to higher education institutions and awarding diplomas to graduates, strengthening measures to ensure public safety and public order , it is important to further increase the interest of young people in science and improve the system of incentives for them.

Expanding access to information on state-type bachelor's and master's diplomas and their applications, as well as their use in advanced foreign practice, will allow these documents to more fully reflect information about higher education and provide easy and complete, clear and convenient information.

In order to bring the bachelor's and master's diplomas and their applications in the form of samples used in advanced foreign practice in the study process, the QR code system is used in the presentation of diplomas and their applications issued by Moscow State University, Harvard University, Oxford University, Hong Kong University, Moscow State Institute of International Relations, St. Petersburg State Polytechnic University, Derby University, University of Groningen, University of Cambridge, University of Nottingham, University of Birmingham, University of Aarhus, University of Manchester, University of Victoria, University of Bristol, University of Alacante and other foreign higher education institutions. As a result, it ensures the reliability, transparency of data and allows for rapid information exchange.

State samples of bachelor's and master's diplomas in higher education, in particular, the expansion of information in diploma applications, providing employers with more complete and detailed information about the graduate is one of the most pressing issues today.

For this purpose, on the basis of the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated July 19, 2019 № 607 "On approval of state samples of bachelor's and master's diplomas in higher education" QR code system was developed and put into practice (https://qrdiplom.edu.uz).

The introduction of this system will allow educational institutions and employers to create a single system that allows to verify the validity of diplomas of higher education institutions of the Republic of Uzbekistan, to store diploma information. That is, when the employer checks the QR code, a link is provided by the system. If the student data in the system corresponds to the paper version, then the diploma is considered valid. Diploma data is integrated with a single database of students.

The purpose of the system – it consists of creating a single database of graduates and a software system for the use of individual QR codes to verify the authenticity of bachelor's and master's degrees.

The main functions of the system are:

- creation of an information system containing information about graduates and a single database that allows to issue individual QR codes to verify the authenticity of bachelor's and master's degrees;
- development of algorithms for generating QR codes to verify the authenticity of the data;
- creation of a system for the department and the dean's office to enter information about the diploma and obtain accurate analytical data on various indicators of graduates;
- creation of mechanisms to ensure data security and integrity, protection of the database from internal and external attacks, as well as the restoration of system data backups.

The system includes information on graduates of higher education institutions, the results of which are mastered. On the basis of this information, the system will form a diploma of graduates with a QR code and a diploma application.

The following information is entered into the system by higher education institutions:

- information about the diploma holder;
- information on qualifications;
- information on the level of education;
- information on the content of education and the results obtained;
- rights and benefits provided by the diploma;
- additional information.

Then the state digital diploma numbers are entered. Upon completion of these processes, diplomas and applications will be published.

Data completion is monitored by the Center for Higher Education Development Research and Advanced Technology Implementation. Provides higher education institutions with diploma and diploma application forms on the basis of an online order. Enters and monitors issued diploma numbers.

As a result, the system created a single database of graduates and their performance. It is also possible to print diplomas with an individual QR code to verify the authenticity of bachelor's and master's diplomas.

The QR code provides the following information to verify the validity of the graduate diploma: the last name, first name and patronymic of the graduate; graduate higher education institution; faculties; direction; group; direction or specialization qualification; period of study; diploma number; link to download the diploma application.

In the course of our research, an expert survey was conducted among graduates of higher education institutions to determine the effectiveness of the use of QR codes in obtaining diplomas. According to the

analysis of the survey results, respondents to the question "What is the convenience for you to get a diploma and its applications using a QR code?" non-spending (37.2%), transparency and completeness of the data, as well as convenience for employment (100.0%). The survey also noted that Internet speed was not affected by the introduction of digital technologies in all areas (92.1%).

Conclusion and recommendations.

Approval of state samples and applications of bachelor's and master's degrees in higher education allows employers (educational institutions for those who continue their studies) to obtain complete information about graduates of higher education institutions without excessive application and without spending time. This is the result, serves to ensure the successful employment of graduates in their specialty (profession) and their place in society, as well as integration in the labor market between employers and higher education institutions that train personnel. The new project of the diploma and its application accelerates the process of employment of graduates and gives employers a complete picture of the database of young professionals, their qualifications, areas of competence, as well as procedures for congratulating students admitted to higher education institutions and awarding diplomas to graduates in order to form the social image of the higher education institution. serves to strengthen conservation measures, further increase the interest of young people in science and improve the system of their incentives.

References:

1. (2020). *Decree of the President of the Republic of Uzbekistan № PF-6097 of October 29, 2020 "On approval of the Concept of science development until 2030"*.
2. Tkacheva, M.V. (2013). Evaluation of valid QR code transformations. *Bulletin of theTula State University. Engineering Science 2013*.
3. Srybina, A. (n.d.). 20 ways to use QR codes. [electronic resource] [site] Retrieved from http://computers-the.ru/?p=211/
4. Logachev, V. (n.d.). *What does the QR code carry*. [electronic resource] [site] Retrieved from http://www.ridcom.ru/publications/131/
5. Kovalchuk, V. I., & Fedotenko, S. G. (3018). Innovative teaching technologies - the basis for the modernization of vocational education. *Young scientist*, № 12, pp. 425-429.
6. Kovalchuk, V. I. (2017). *Trends in the development of education in the era of the information society. Strategies for the intensification of higher education in the humanities in Ukraine and the EU*: monograph / V. I. Kovalchuk [and others]. (pp.7-134). K.: Nubip Ukraine.
7. (n.d.). *Technology of QR codes // Technical characteristics of QR codes.* – [Electronic resource]. Retrieved 05.11.2021 from http://QRcode.creambee.ru/blog/post/qr-specification/
8. (n.d.). *QR code in the educational process* [Electronic resource]. Retrieved 05.11.2021 from http://www.slideshare.net/yak-ella/qr-18099167
9. (n.d.). *An e-book about QR codes. The Complete Guide to Marketing Using QR Codes*. - [Electronic resource]. Retrieved 05.11.2021 from http://ru.QR-code-generator.com/QR-code-marketing/QR-codes-basics/
10. (n.d.). *Wikipedia - free encyclopedia [Electronic resource]*. Retrieved 05.11.2021 from https://ru.wikipedia.org/wiki/QR-code